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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/761,908	01/21/2004	John E. Holowczak	U76.12-0003	4656
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KINNEY & LANGE, P.A. THE KINNEY & LANGE BUILDING 312 South Third Street Minneapolis, MN 55415-1002			EXAMINER DANIELS, MATTHEW J	
			ART UNIT 1732	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/761,908	HOLOWCZAK ET AL.	
Examiner	Art Unit		
Matthew J. Daniels	1732		

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 09 April 2007.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-8 and 17-26 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-8 and 17-26 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948) Paper No(s)/Mail Date. ____.
3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 5) Notice of Informal Patent Application
6) Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Claims 1-26 in the reply filed on 9 April 2007 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 1-8 and 19** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The term "ultrafine" is new and does not appear to be supported by the specification for any sizes which are implied by the term.

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3. **Claims 1-8 and 19** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The term "ultrafine" in claims 1, 3, and 19 is a relative term which renders the claim indefinite. The term "ultrafine" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1, 2, 4-8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Weaver (USPN 4341725) in view of Whalen (USPN 5824250) and Auxier (USPN 6247896). **As to Claim 1**, Weaver teaches a method for producing ceramic articles, comprising the steps of:

- a) providing a disposable mold having a cavity which has the shape of the desired ceramic article (1:55-68 and 2:49-68)
- b) filling the cavity with a ceramic slurry which includes a liquid carrier (1:60-62). Weaver further teaches that colloidal silica is suitable for use in a casting slip, and either the refractory powder (2:10-11) or the colloidal silica sol (2:11) is considered to be ultrafine.
- c) cooling the slurry filled mold cavity to solidify the slurry (1:62-65 and column 2)
- d) removing the disposable mold (1:63-65 and 2:49-56)

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e) removing substantially all of the original liquid carrier from the solidified slurry to produce a ceramic article (2:23-48).

Weaver is silent to (a) the rapid prototyping process to produce the mold, and (b) the microcircuit dimensions. However, these aspects of the invention would have been *prima facie* obvious for the following reasons.

a) Whalen teaches that it is known to use a rapid prototyping process to produce a disposable mold (3:18-37) for a turbine blade (4:45-67).

b) Auxier teaches that it is known to provide microcircuits in turbine blades (Figs. 1-5) for the purpose of cooling. Whalen provides a rapid prototyping process capable of producing the microcircuit cavities of Auxier.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Whalen and Auxier into that of Weaver (a1) in order to allow design changes in components, (a2) in order to build mold components with thin, non-machineable sections or complex non-injectable protrusions, and (a3) reduce the manufacturing costs by directly fabricating fugitive molds for casting of ceramic slurries (Whalen, 3:60-67), and (b1) because Whalen suggests turbine parts (4:7) and the cooling channels of Auxier would provide a cooling channel to a turbine (1:6) blade that would increase the lifetime of the blade and provide the ability to operate at higher temperatures, increasing the efficiency of the gas turbine engine.

As to Claim 2, Weaver (2:11) teaches aqueous slurries. **As to Claim 4**, Whalen teaches wax (3:24-27), among other materials, and the microcircuit dimensions were addressed above under the rejection of Claim 1. **As to Claim 5**, Whalen teaches that the mold may be removed

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prior to the removal of the original liquid carrier (3:54-58), and the microcircuit dimensions were addressed above under the rejection of Claim 1. **As to Claim 6**, Weaver teaches that it is known to dry prior removal of the mold (2:2-4), and the microcircuit dimensions were addressed above under the rejection of Claim 1. **As to Claim 7**, Weaver teaches at least sublimation (2:30-48) and vacuum dewatering (2:46). **As to Claim 8**, Weaver teaches sintering which would inherently improve mechanical properties (2:47-48).

5. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Weaver (USPN 4341725) in view of Whalen (USPN 5824250), Auxier (USPN 6247896), and further in view of Downing (USPN 3885005). Weaver, Whalen, and Auxier teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 3**, Weaver teaches ceramic particles (4:15-21), an amount of cryoprotectant sufficient to suppress the formation of large crystals (3:31-32), colloidal silica (2:14), less than 5% of other additives (sodium silicate, for example, 5:8), and a balance of water. Weaver is silent to the particular mixture of 70%-90% ceramic particles with 10%-30% of a liquid suspension of a colloidal ceramic. However, Downing teaches 70%-90% ceramic particles with 10%-30% of a liquid suspension of a colloidal ceramic (2:7-12 and Table, example 5), and it is submitted that these are "ultrafine". It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Downing into that of Weaver because Weaver suggests Downing's method (2:8-9).

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6. **Claims 17, 18, and 20-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Weaver (USPN 4341725) in view of Whalen (USPN 5824250), Auxier (USPN 6247896) and Campion (USPN 5503218).

As to Claim 17, Weaver teaches a method for producing ceramic articles, comprising the steps of:

- a) providing a disposable mold having a cavity which has the shape of the desired ceramic article (1:55-68 and 2:49-68),
- b) filling the cavity with a ceramic slurry which includes a liquid carrier (1:60-62). Weaver further teaches that colloidal silica is suitable for use in a casting slip, and either the refractory powder (2:10-11) or the colloidal silica sol (2:11) is considered to be ultrafine.
- c) cooling the slurry filled mold cavity to solidify the slurry (1:62-65 and column 2)
- d) removing the disposable mold (1:63-65 and 2:49-56)
- e) removing substantially all of the original liquid carrier from the solidified slurry to produce a ceramic article (2:23-48).

Weaver is silent to

- a) producing a ceramic mold for casting metallic parts having internal passages with microcircuit dimensions
- b) using a rapid prototyping process to produce the mold having microcircuit dimensions
- c) the external shape corresponding to the desired external configuration and an internal passage shape corresponding to the shape of the desired metallic part internal passage shape of the metallic part and placing the temporary pattern in a container

However, these aspects of the invention would have been *prima facie* obvious for the following reasons:

- a) Campion teaches producing a ceramic mold for casting metallic parts (Figs. 1-4). Auxier teaches that in metallic turbine parts, it is desirable to have internal passages with microcircuit dimensions (Figs. 1-5).
- b) Whalen teaches that it is known to use a rapid prototyping process to produce a disposable mold (3:18-37) having a features that are of a size that is interpreted to be microcircuit dimensions (4:54). Auxier teaches microcircuit passages that could be fabricated by the method of Whalen.
- c) Campion teaches the external shape corresponding to the desired external configuration and an internal passage shape (2:53-56 and area between 2 and 4 in Fig. 2) corresponding to the shape of the desired metallic part internal passage shape of the metallic part (area between 2 and 4 in Fig. 2) and placing the temporary pattern in a container (Fig. 4). Auxier teaches that this internal passage may have a microcircuit shape and dimension in order to provide cooling.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Whalen, Campion, and Auxier into that of Weaver in order to (a) allow design changes in components (Whalen, 3:60-67, Campion, 1:26-46), (b) build mold components with thin, non-machineable sections or complex non-injectable protrusions (Whalen, 3:60-67, Campion, 1:26-46), (c) reduce the manufacturing costs by directly fabricating fugitive molds for casting of ceramic slurries (Whalen, 3:60-67, Campion, 1:26-46), and (d) because Whalen suggests turbine parts (4:7) and the cooling channels of Auxier would provide a cooling channel to a turbine (1:6) blade that would increase the lifetime of the blade and provide

the ability to operate at higher temperatures, increasing the efficiency of the gas turbine engine.

As to Claim 18, Weaver (2:11) teaches aqueous slurries. **As to Claim 20**, Whalen teaches wax (3:24-27), among other materials. **As to Claim 21**, Whalen teaches that the mold may be removed prior to the removal of the original liquid carrier (3:54-58). **As to Claim 22**, Weaver teaches that it is known to dry prior removal of the mold (2:2-4). **As to Claim 23**, Weaver teaches removing the original liquid carrier at a temperature below the solidification point (2:31, lyophilizing is synonymous with freeze drying). **As to Claim 24**, Weaver teaches sintering which would inherently improve mechanical properties (2:47-48). **As to Claim 25**, Campion teaches a plurality of channels which extend through the model and connect the external surface of the model with the internal surface of the model (Fig. 2), which are interpreted to have microcircuit dimensions. **As to Claim 26**, Auxier teaches that it is known to provide channels with microcircuit dimensions having a complex geometry (Fig. 5), which would be provided in the method of Weaver in order to increase the cooling of the article.

7. **Claim 19** is rejected under 35 U.S.C. 103(a) as being unpatentable over Weaver (USPN 4341725) in view of Whalen (USPN 5824250), Auxier (USPN 6247896) and Campion (USPN 5503218), and further in view of Downing (USPN 3885005). Weaver, Whalen, Auxier, and Campion teach the subject matter of Claim 17 above under 35 USC 103(a). **As to Claim 19**, Weaver teaches ceramic particles (4:15-21), an amount of cryoprotectant sufficient to suppress the formation of large crystals (3:31-32), colloidal silica (2:14), less than 5% of other additives (sodium silicate, for example, 5:8), and a balance of water. Weaver is silent to the particular mixture of 70%-90% ceramic particles with 10%-30% of a liquid suspension of a colloidal

ceramic. However, Downing teaches 70%-90% ceramic particles with 10%-30% of a liquid suspension of a colloidal ceramic (2:7-12 and Table, example 5). It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Downing into that of Weaver because Weaver suggests Downing's method (2:8-9).

Response to Arguments

8. Applicant's arguments filed 9 April 2007 have been fully considered but they are not persuasive or are moot in view of the new grounds of rejection above. The arguments appear to be on the following grounds:

- a) In the Whalen patent, rapid prototype patterns are produced with features of 0.006 inches and 0.010 inches. These are not microcircuit dimensions.
- b) Downing teaches coarse particles (and therefore does not provide ultrafine particles).

9. These arguments are not persuasive for the following reasons:

- a) Applicants' remarks note that Whalen provides 0.006 inches layer thickness. In a first interpretation, Auxier teaches that a microcircuit area can be as great as 0.1 square inches (6:58). In view of the teaching in Fig. 5 (Auxier) that this area corresponds to a square, the microcircuit dimension (i.e. the largest length of a microcircuit) would be 0.32 inches. In a second interpretation, even if the cross section of the passage were considered as the "microcircuit dimension", if assumed to be a square cross section having an area of 0.0006 square inches (Auxier, 6:67), it would still provide a channel width (microcircuit dimension) of 0.024 inches, substantially larger than the 0.006 inch layer thickness of Whalen and/or the particle size of

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Downing. It is submitted that either interpretation is valid, and that both could be produced by the Whalen process.

b) There is no disclosure of "ultrafine" particles that would exclude the references to Weaver or Downing, particularly in view of the microcircuit dimension which is interpreted to be any dimension smaller than 0.32 inches. It is noted that the invention includes particles of up to 50 microns, which would not be "submicron" as asserted on page 7 of the remarks. 200 mesh (Downing) corresponds to a particle size of about 0.003 inches, which is not substantially different than the 0.002 inch (50 micron) particle size of the disclosed invention. It is submitted that the particles of Weaver and Downing are ultrafine.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Daniels whose telephone number is (571) 272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



MJD 7/6/07

/Christina Johnson/
Christina Johnson
Supervisory Patent Examiner
AU 1732